

PATENT ABSTRACTS OF JAPAN

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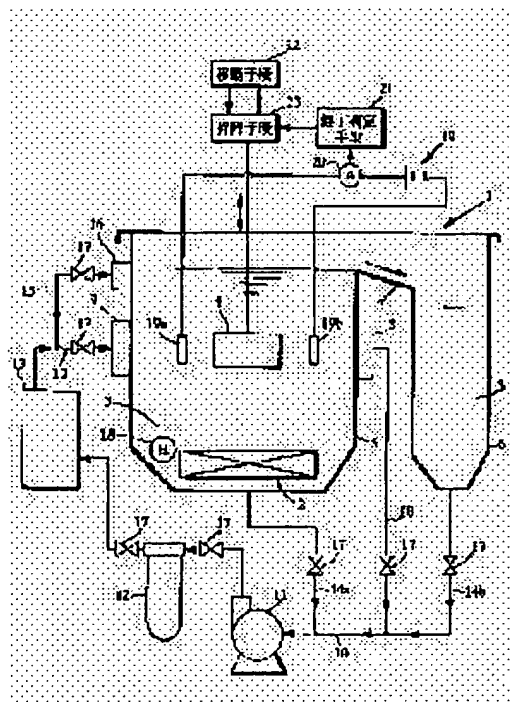
(54) CLEANING METHOD AND CLEANER

(57)Abstract:

PURPOSE: To provide a cleaning method and a cleaner in which uniform cleaning quality is obtained irrespective of the state of individual workpieces.

CONSTITUTION: A workpiece 4 is immersed in cleaning liquid 3 in a cleaning tank 5 and cleaned. The cleaning liquid 3 is fed into the cleaning tank 5 and the cleaning liquid 3 contaminated with oil component foreign matter, etc., is discharged outside the cleaning tank 5. The electrical conductivity of the cleaning liquid 3 in the cleaning tank 5 is measured. When the variation in electrical conductivity within a prescribed time becomes not more than a prescribed criteria of judgement, the termination of the cleaning is decided otherwise, when the variation in electrical conductivity within a prescribed

time disappears, the termination of the cleaning is judged. The cleaning liquid 3 is filtered at the outside of the cleaning tank 5 and circulated. A cleaner 1 consists of the cleaning tank 5, cleaning liquid feeding means 9 and a cleaning liquid discharge means 8. An electrical conductivity measuring means 20 is installed in the cleaning tank 5, and a termination deciding means 21 is installed. A cleaning liquid circulating means 10 for connecting the cleaning liquid discharge means 8 and the cleaning liquid feeding means 9 is formed, and the cleaning liquid circulating means 10 is provided with a cleaning liquid filtration means 12. An ultrasonic vibrator 2 is installed in the bottom part of the cleaning tank 50.



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CLAIMS

[Claim(s)]

[Claim 1] When it is immersed and a work is washed to the penetrant remover held in the washing tub, while supplying a pure penetrant remover to this washing tub In the washing method which discharges the penetrant remover which the oil content removed by washing of this work, the foreign matter, etc. mixed out of this washing tub The washing method characterized by judging the end of the aforementioned washing when the electric conductivity of the aforementioned penetrant remover in the aforementioned washing tub is measured and the size of change of this electric conductivity in a predetermined time becomes below a predetermined decision value.

[Claim 2] The washing method according to claim 1 characterized by judging the end of the aforementioned washing when change of this electric conductivity in the aforementioned predetermined time is lost.

[Claim 3] the above -- the penetrant remover which the oil content, the foreign matter, etc. mixed -- the outside of the aforementioned washing tub -- filtering -- the above -- the washing method according to claim 1 characterized by circulating to the aforementioned washing tub as a pure penetrant remover

[Claim 4] The washing tub which holds a penetrant remover. A penetrant remover supply means to supply a pure penetrant remover to this washing tub when it is immersed and a work is washed to this washing tub. A penetrant remover eccrisis means to discharge the penetrant remover which the oil content removed by washing of this work, the foreign matter, etc. mixed out of this washing tub. It is the washing station equipped with the above, and an electric conductivity measurement means to measure measurement for the electric conductivity of this penetrant remover to this washing tub is established, an end judging means to judge the end of the aforementioned washing when the size of change in the predetermined time of the electric conductivity of the aforementioned penetrant remover measured by this electric conductivity measurement means becomes below a predetermined decision value is established, and it is characterized by the bird clapper.

[Claim 5] a penetrant remover circulation means make this washing tub circulate through the penetrant remover which connected the aforementioned penetrant remover eccrisis means and the aforementioned penetrant remover supply means, and was taken out from the aforementioned washing tub by this penetrant remover eccrisis means by this penetrant remover supply means -- preparing -- this penetrant remover circulation means -- the above -- the washing station according to claim 4 which establishes a penetrant remover filtration means filter an oil content, a foreign matter, etc., and is characterized by the bird clapper

[Claim 6] The washing station according to claim 4 which prepares a ultrasonic vibrator in the pars basilaris ossis occipitalis of the aforementioned washing tub, and is characterized by the bird clapper.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the method and washing station which are immersed in the penetrant remover held in the washing tub in a work, and are washed by ultrasonic cleaning etc.

[0002]

[Description of the Prior Art] Conventionally, a work is immersed in the penetrant remover held in the ultrasonic-cleaning tub which equips a pars basilaris ossis occipitalis with a ultrasonic vibrator in works, such as a fabricating-operation article, and the ultrasonic-cleaning method which emits and washes an ultrasonic wave from the aforementioned ultrasonic vibrator to the aforementioned penetrant remover is learned. the foreign matter of solid-states, such as a foreign matter of solid-states, such as material waste which has adhered to removal or the work front face of a barricade by obtaining the cleaning effect which was excellent in such an ultrasonic-cleaning method by using the penetrant remover which deaerated the dissolved gas, and changing the grade of deaeration according to a work, and material waste which has adhered to the work front face through an oil content, or an oil content -- the very thing etc. can be washed

[0003] By the aforementioned ultrasonic-cleaning method, an oil content, a foreign matter, etc. which were removed from the work by washing of a work mix in the aforementioned penetrant remover, and if it is left, the washing capacity of this penetrant remover will be lost for a short time. Then, maintenance of the washing capacity is achieved by an oil content, a foreign matter, etc. which were mixed in this penetrant remover removing, and circulating to the aforementioned ultrasonic-cleaning tub as a pure penetrant remover by usually taking out and filtering the aforementioned penetrant remover out of the aforementioned ultrasonic-cleaning tub.

[0004] By the aforementioned ultrasonic-cleaning method, being washing time immersed of predetermined is carried out, and a work is washed by the aforementioned penetrant remover. Since the aforementioned washing time is experientially deduced according to the gestalt of a work and the aforementioned penetrant remover is maintained by the state pure above always, a work can be efficiently washed under a certain condition by setting up the aforementioned washing time beforehand.

[0005] However, if it washes according to the aforementioned washing time set up beforehand, since the aforementioned washing time will become fixed irrespective of the state of each work, there is un-arranging, that nonuniformity may be made to the washing quality for every work.

[0006]

[Problem(s) to be Solved by the Invention] this invention cancels this un-arranging and aims at offering the washing method and washing station which can obtain uniform washing quality irrespective of the state of each work.

[0007]

[Means for Solving the Problem] In order to attain this purpose, the washing method of this invention When it is immersed and a work is washed to the penetrant remover held in the washing tub, while supplying a pure penetrant remover to this washing tub In the washing method which discharges the penetrant remover which the oil content removed by washing of this work, the foreign matter, etc. mixed out of this washing tub When the electric conductivity of the aforementioned penetrant remover in the aforementioned washing tub is measured and the size of change of this electric conductivity in a predetermined time becomes below a predetermined decision value, it is characterized by judging the end of the aforementioned washing.

[0008] When change of this electric conductivity in the aforementioned predetermined time is lost, you may make it the washing method of this invention judge the end of the aforementioned washing.

[0009] moreover, the washing method of this invention -- the above -- the penetrant remover which the oil content, the foreign matter, etc. mixed -- the outside of the aforementioned washing tub -- filtering -- the above -- it is characterized by circulating to the aforementioned washing tub as a pure penetrant remover

[0010] A penetrant remover supply means to supply a pure penetrant remover to this washing tub when the washing method of this invention immerses for it and washes a work to the washing tub which holds a penetrant remover, and this washing tub, In the washing station which consists of a penetrant remover eccrisis means to discharge the penetrant remover which the oil content removed by washing of this work, the foreign matter, etc. mixed out of this washing tub An electric conductivity measurement means to measure measurement for the electric conductivity of this penetrant remover is prepared in this washing tub. When the size of change in the predetermined time of the electric conductivity of the aforementioned penetrant remover measured by this electric conductivity measurement means becomes below a predetermined decision value, it can carry out advantageously by the washing station which comes to prepare an end judging means to judge the end of the aforementioned washing.

[0011] a penetrant-remover circulation means make this washing tub circulate through the penetrant remover which connected the aforementioned penetrant remover eccrisis means and the aforementioned penetrant remover supply means, and was taken out from the aforementioned washing tub by this penetrant remover eccrisis means in the aforementioned washing station by this penetrant remover supply means -- preparing -- this penetrant-remover circulation means -- the above -- a penetrant-remover filtration means filter an oil content, a foreign matter, etc. is established, and a bird clapper is carried out as the feature Moreover, the aforementioned washing station prepares a ultrasonic vibrator in the pars basilaris ossis occipitalis of the aforementioned washing tub, and is characterized by the bird clapper.

[0012]

[Function] If a work is washed in the penetrant remover held in the washing tub, the foreign matter of the oil content removed from the work and a solid-state will mix in a penetrant remover. if the penetrant remover which the foreign matter of the oil content removed by washing of the aforementioned work and a solid-state mixed is discharged out of this washing tub while supplying a pure penetrant remover to the aforementioned washing tub at this time -- the above -- although the amount of the foreign matter of an oil content and a solid-state once increases immediately after the washing start of a work, it decreases gradually and the penetrant remover in a washing tub is again returned to a pure state

[0013] the above -- since the foreign matter of an oil content and a solid-state carries movement of a charge in the aforementioned penetrant remover -- the electric conductivity of the aforementioned penetrant remover -- the above in the aforementioned penetrant remover -- it fluctuates corresponding to the amount of the foreign matter of an oil content and a solid-state That is, in the pure penetrant remover before washing a work, **** low electric conductivity becomes high rapidly immediately

after starting washing of a work, and if the amount of the foreign matter of the oil content which washing advances and is mixed in this penetrant remover from this work, and a solid-state is decreased successively, it will become low gradually.

[0014] therefore, the above mixed in the aforementioned penetrant remover when having measured the electric conductivity of the aforementioned penetrant remover in the aforementioned washing tub, and the electric conductivity which once increased started to decrease and the size of change of this electric conductivity in a predetermined time became below a predetermined decision value -- the foreign matter of an oil content and a solid-state is discharged, and it judges that new mixing was lost more than it -- having -- this time -- with, the end of the aforementioned washing is judged

[0015] By the washing method of this invention, when change of the electric conductivity in a predetermined time is lost, the aforementioned judgment becomes easy by judging the end of the aforementioned washing.

[0016] the washing method of this invention -- the above -- the penetrant remover which the oil content, the foreign matter, etc. mixed -- the outside of the aforementioned washing tub -- filtering -- the above -- the above included in the penetrant remover in the aforementioned washing tub by circulating to the aforementioned washing tub as a pure penetrant remover -- the amount of the foreign matter of an oil content and a solid-state is reduced, and the end of the aforementioned washing is judged from the electric conductivity of the aforementioned penetrant remover like the above Moreover, by circulating a penetrant remover as mentioned above, a penetrant remover can be repeated and used and cost is reduced.

[0017] In the washing station of this invention, when washing by immersing a work in the penetrant remover held in the washing tub, while a pure penetrant remover is supplied to the aforementioned washing tub by the aforementioned penetrant remover supply means, the penetrant remover mixed [foreign matter / the oil content removed from the aforementioned work by the aforementioned penetrant remover eccrisis means,] is discharged out of this washing tub. And the electric conductivity of the penetrant remover in the aforementioned washing tub is measured with time by the electric conductivity measurement means prepared in the aforementioned washing tub, and when the size of change in the predetermined time of this electric conductivity becomes below a predetermined decision value, the end of the aforementioned washing is judged by the aforementioned end judging means.

[0018] a penetrant-remover circulation means connect the aforementioned penetrant-remover eccrisis means and the aforementioned penetrant-remover supply means at the aforementioned washing station -- preparing -- this penetrant-remover circulation means -- the above -- the penetrant remover taken out from the aforementioned washing tub by the aforementioned penetrant-remover eccrisis means by establishing a penetrant-remover filtration means filter an oil content, a foreign matter, etc. -- the aforementioned filtration means -- the above -- an oil content, a foreign matter, etc. are filtered and it circulates to the aforementioned washing tub by the aforementioned penetrant-remover supply means as a pure penetrant remover

[0019] Moreover, the washing station of this invention is especially used advantageously, when preparing a ultrasonic vibrator in the pars basilaris ossis occipitalis of the aforementioned washing tub and performing ultrasonic cleaning. the above which has adhered to the aforementioned work according to the aforementioned ultrasonic cleaning -- an oil content, a foreign matter, etc. are removed quickly and the cleaning effect which was excellent when discharged by the aforementioned aforementioned penetrant remover eccrisis means out of the aforementioned washing tub is obtained Since the aforementioned ultrasonic cleaning is performed very quickly, change of the electric conductivity of the aforementioned penetrant remover is grasped easily, and the end of the aforementioned ultrasonic cleaning is judged certainly.

[0020]

[Example] Next, it explains in more detail about the washing method of this invention, and a washing station, referring to an attached drawing. the ** type view in which drawing 1 shows the example of 1 composition of the washing station of this invention -- it is -- drawing 2 -- washing time and an oil content -- it is the graph which shows the relation between the amount of residues, and current value

[0021] The ultrasonic-cleaning tub 5 which emits an ultrasonic wave to a penetrant remover 3 from ultrasonic-vibrator equipment 2, and washes a work 4 when the ultrasonic cleaner 1 of this example is immersed in the penetrant remover 3 to which ultrasonic-vibrator equipment 2 was supplied in the tub in preparation for a pars basilaris ossis occipitalis in a work 4, as shown in drawing 1 , It consists of an overflow tub 6 which holds the penetrant remover 3 overflowed when it is adjacently prepared in the ultrasonic-cleaning tub 5 and a work 4 is immersed in the ultrasonic-cleaning tub 5, and the ultrasonic-cleaning tub 5 and the overflow tub 6 are connected by the sloping effluent way 7.

[0022] Moreover, ultrasonic-vibrator equipment 2 comes to hold the ultrasonic vibrator which is not illustrated in the hermetically sealed enclosure made from stainless steel, and this ultrasonic vibrator emits a predetermined ultrasonic wave based on the ultrasonic signal sent from an external ultrasonic wave oscillator. In order to protect ultrasonic-vibrator equipment 2 from the erosion by the ultrasonic wave, nickel plating is performed to the front face.

[0023] Penetrant remover output port 8 and the penetrant remover feed hopper 9 carry out phase opposite, and are prepared in the side of the ultrasonic-cleaning tub 5, it connects through the conduit 10 in the exterior of the ultrasonic-cleaning tub 5, and the penetrant remover 3 in the ultrasonic-cleaning tub 5 circulates through penetrant remover output port 8 and the penetrant remover feed hopper 9 from penetrant remover output port 8 to the penetrant remover feed hopper 9 via a conduit 10 with the pump 11 formed in the middle of the conduit 10. In addition, the rectifier (not shown) which forms a laminar flow parallel to ultrasonic-vibrator equipment 2 within the ultrasonic-cleaning tub 5 by the penetrant remover 3 which is taken out from the ultrasonic-cleaning tub 5, or is supplied to the ultrasonic-cleaning tub 5 is built in penetrant remover output port 8 and the penetrant remover feed hopper 9.

[0024] A filter 12 is formed in the lower stream of a river of a pump 18 at a conduit 10, the foreign matter of solid-states, such as an oil content mixed in a penetrant remover 3 by washing of a work 4 or a barricade, and material waste, is filtered, and it removes.

[0025] Moreover, the deaerator 13 which deaerates the dissolved gas of a penetrant remover 3 is formed in the lower stream of a river of a filter 12 at the conduit 10. The vacuum deairing equipment which a deaerator 13 introduces a penetrant remover 3 into the decompressed seal tub, is made to emit the dissolved gas in a penetrant remover 3 to the reduced pressure space in this seal tub, and is deaerated, Many hollow-filament-like gas permeation membranes are held, and while circulating a penetrant remover 3 in this hollow-filament-like gas permeation membrane, the gas-permeation-membrane module which decompresses the outside of this hollow-filament-like gas permeation membrane, and separates the dissolved gas in a penetrant remover 3 through this hollow-filament-like gas permeation membrane is used.

[0026] A penetrant remover 3 is deaerated by the deaerator 13, and the dissolved oxygen concentration is adjusted in 0.01-5 ppm according to the gestalt or the washing purpose of a work 4. In addition, since a ultrasonic cleaner 1 is used in air, although the gas dissolved in the penetrant remover 3 is air in fact, since air composition is simultaneously regularity in oxygen:nitrogen **1:4, dissolved oxygen concentration is used as an index which shows total dissolved gas concentration.

[0027] the pars basilaris ossis occipitalis of the ultrasonic-cleaning tub 5 and the overflow tub 6 -- respectively -- the object for eccrisis of a penetrant remover 3 -- Conduits 14a and 14b prepare -- having -- **** -- the object for eccrisis -- Conduits 14a and 14b are connected to the conduit 10 by the upstream of a pump 11 moreover, the conduit 10 -- the lower stream of a river of a deaerator 13 --

assistance -- a conduit 15 -- branching -- assistance -- the conduit 14 is connected to the auxiliary feed hopper 16 prepared in the upper part of the ultrasonic-cleaning tub 5 the above -- a conduit 10 and the object for eccrisis -- Conduits 14a and 14b and assistance -- a bulb 17 arranges in a conduit 15 suitably -- having -- each -- the flow rate of a conduit can be adjusted now Moreover, the heater 18 is formed in the pars basilaris ossis occipitalis of the ultrasonic-cleaning tub 5 so that a penetrant remover 3 can be warmed if needed.

[0028] In the ultrasonic cleaner 1 of ****1****, the electric conductivity of a penetrant remover 3 is measured by the current detector 20 which formed the power supply 19 of direct-current 12V outside, connected with the electrode boards 19a and 19b immersed in the ultrasonic-cleaning tub 5, and was connected with DC power supply 19 in series. Moreover, the current detector 20 is connected to an end judging means 21 to judge the end of washing of a work 4 from the size of change in the predetermined time of the aforementioned electric conductivity.

[0029] Furthermore, the work 4 conveyed by move means 22 to transport a work 4 to a ultrasonic cleaner 1, and to take out, and the move means 22 is transferred to a ultrasonic cleaner 1, a rise-and-fall means 23 by which it is immersed in the ultrasonic-cleaning tub 5 is formed in it, it connects with the rise-and-fall means 23, and the aforementioned end judging means 21 controls the operation.

[0030] Next, the case where the blade (iron) of a compressor is washed as a work 4 is taken and explained to an example about the washing method by the ultrasonic cleaner 1 of this example. Double-sided lap processing is given with the abrasive grain (8.0 micrometers of mean particle diameters) and straight mineral oil of #1500, and, as for the blade of a compressor, an abrasive grain and material waste have adhered to the front face with straight mineral oil.

[0031] By the washing method of this example, the aforementioned blade (work 4) first held in the receipt basket made from stainless steel which is not illustrated is transported to a ultrasonic cleaner 1 from a last process by the move means 22, and is transferred to the rise-and-fall means 23 the aforementioned whole receipt basket. Subsequently, the rise-and-fall means 23 descends and the aforementioned blade (work 4) held in this receipt basket is immersed in the ultrasonic-cleaning tub 5. And the end judging means 21 operates and measurement of the electric conductivity of a penetrant remover 3 is immediately started by the current detector 20.

[0032] The tap water containing 5% of weak alkali cleaners is supplied to the ultrasonic-cleaning tub 5 as a penetrant remover 3, and a penetrant remover 3 is taken out from penetrant remover output port 8 with a pump 11, and it circulates through it to the ultrasonic-cleaning tub 5 via the filter 12 and the deaerator 13 with the conduit 10 from the penetrant remover feed hopper 9 and the auxiliary feed hopper 16. The aforementioned circulation and it is performed by [as supplying about 0.25 - 0.95%/second of penetrant removers 3 of the capacity of the ultrasonic-cleaning tub 5]. In this example, the 0.25l. [/second] penetrant remover 3 is discharged and supplied to the ultrasonic-cleaning tub 5 which has a capacity of 60l.

[0033] Next, from the ultrasonic vibrator held in ultrasonic-vibrator equipment 2, an ultrasonic wave is emitted to a penetrant remover 3, and ultrasonic cleaning of a work 4 is performed. The aforementioned ultrasonic wave is 25kHz in output 600w and frequency, and is 1 w/cm². It is density.

[0034] the impulse wave by decay of cavitation since the penetrant remover 3 is deaerated so that it may become the aforementioned dissolved oxygen concentration if ultrasonic cleaning of a work 4 is started -- the front face of a work 4 -- acting -- an oil content -- and -- this -- the foreign matter of the solid-state which has adhered through an oil content is removed from the front face of a work 4, and mixes in a penetrant remover 3 then, the above -- since the foreign matter of an oil content and a solid-state carries movement of a charge in a penetrant remover 3, the electric conductivity of a penetrant remover 3 becomes high, and is detected by the current detector 20 as an increase in the

current between electrode board 19a and 19b

[0035] If the foreign matters of the oil content and solid-state from which washing of a work 4 is removed by going on decrease in number since it circulates to the ultrasonic-cleaning tub 5 from the penetrant remover feed hopper 9 and the auxiliary feed hopper 16 after a penetrant remover 3 is taken out from penetrant remover output port 8 as mentioned above and filtered with a filter 12, it will defecate gradually the penetrant remover 3 in the ultrasonic-cleaning tub 5, and the electric conductivity of the aforementioned penetrant remover 3 will be decreased successively. Successive diminution of this electric conductivity is measured with time by the current detector 20, and is outputted to the end judging means 21. And if it detects that the change of the aforementioned electric conductivity of the end judging means 21 was lost within the predetermined time, it will judge with what washing ended, the rise-and-fall means 23 will be raised, and the aforementioned receipt basket will be pulled up from the ultrasonic-cleaning tub 5.

[0036] Next, the aforementioned receipt basket which was able to be pulled up is transferred to the transfer means 22 from the rise-and-fall means 23, and is taken out from a ultrasonic cleaner 1, and washing operation ends it.

[0037] the aforementioned washing operation -- setting -- with time -- continuing -- the oil content of a work 4 -- when the amount of residues was measured, the result as shown in the following table 1 was obtained in addition, the above -- an oil content -- the oil content in which the amount of residues has adhered to the work 4 -- a carbon tetrachloride -- extracting -- the oil content in the carbon tetrachloride of the specified quantity -- it asked by measuring concentration with an infrared absorption method

[0038]

[Table 1]

洗淨時間 (秒)	0	0.5	1.0	2.0	5.0	10	30	60	90
油分残渣 (mg)	250	55	45	18.5	5.6	0.80	0.42	0.40	0.36

[0039] If washing time becomes 30 seconds or more from Table 1, it is clear that it becomes the amount of traces of the oil content which had adhered before the amount of residues of the oil content adhering to the work 4 washing, and can treat as an excellent article.

[0040] Next, the current value of the penetrant remover 3 between electrode board 19a corresponding to the washing time of Table 1 measured by the current detector 20 as electric conductivity of a penetrant remover 3 for every time and 19b is shown in the following table 2.

[0041]

[Table 2]

洗淨時間 (秒)	0	0.5	1.0	2.0	5.0	10	30	60	90
電流値 (mA)	10	75	50	24	10	5	1.5	1.5	1.5

[0042] After 30 second when the oil content in which the current value which became high rapidly soon when washing started fell gradually along with advance of washing, and has adhered to the work 4 serves as the amount of traces from Table 2, it is clear that the change is lost by 1.5mA. Although what an oil content, an abrasive grain, material waste, etc. mix this in a penetrant remover 3 immediately after the start of washing, and carries movement of a charge in a penetrant remover 3

increases rapidly Since it circulates through a penetrant remover 3 as mentioned above and it is filtered with a filter 12, oil contents, abrasive grains, material waste, etc. in a penetrant remover 3 decrease in number gradually, and it can reach for the oil content adhering to the work 4 to become the amount of traces, and can be considered to become fixed.

[0043] The graph which compounded the result of Table 1 and 2 is shown in drawing 2 . By this example, although it almost has the amount of traces after the amount of residues of the oil content adhering to the work 4 decreases quickly and 30 seconds pass since a washing start by ultrasonic cleaning, the current value of a penetrant remover 3. increases once after a washing start, and becomes fixed after 30 seconds, so that clearly from Table 1, Table 2, and drawing 2 . And henceforth [this time], since change is lost, change of the aforementioned current value can be grasped easily and the end of washing can be judged certainly.

[0044] You may make it judge with what washing ended as what does not have influence in a cleaning effect substantially even if it continues washing more than it, when it is decreasing with the inclination with the aforementioned loose current value between predetermined times, for example, 30 arbitrary seconds, although, as for the aforementioned current value, change was completely lost at this example henceforth [30 second after a washing start], and it becomes below less than current value predetermined in the range of fluctuation, for example, 1mA.

[0045] Moreover, although the current value of the penetrant remover 3 between the electrode boards 19a and 19b immersed in the ultrasonic-cleaning tub 5 is measured in the ultrasonic cleaner 1 of ****1****, when the basket made from the aforementioned stainless steel is immersed in the ultrasonic-cleaning tub 5 and a work 4 is washed, in order to use the capacity of the ultrasonic-cleaning tub 5 efficiently, the space immersed in the electrode boards 19a and 19b may not be obtained. When such, one side of the electrode boards 19a and 19b is replaced with the basket or the ultrasonic-vibrator equipment 2 made from stainless steel with which a work 4 is held, and it may be made use the basket or the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel as an electrode board, and the basket and the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel are connected to DC power supply 19, and you may make it use the basket and the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel as an electrode board. When using the basket and the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel as an electrode board, the basket made from for example, the aforementioned stainless steel is connected to the anode plate side of DC power supply 19, and ultrasonic-vibrator equipment 2 is connected to the cathode side of DC power supply 19.

[0046] Furthermore, when the ultrasonic-cleaning tub 5 consists of a conductive material, you may use the ultrasonic-cleaning tub 5 as an electrode. When using the ultrasonic-cleaning tub 5 as an electrode, the current value of the penetrant remover 3 between the ultrasonic-cleaning tub 5, a work 4, or ultrasonic-vibrator equipment 2 is measured, or the electrode boards 19a or 19b are immersed in a penetrant remover 3, and the current value of the penetrant remover 3 between the electrode boards 19a or 19b and the ultrasonic-cleaning tub 5 is measured.

[0047]

[Effect of the Invention] In case a work is washed according to the washing method of this invention so that clearly from the above thing, the electric conductivity of the aforementioned penetrant remover in the aforementioned washing tub is measured. When the size of change of this electric conductivity in a predetermined time becomes below a predetermined decision value, by judging with what the aforementioned washing ended, washing can be ended for every washing of each work at the suitable time, and the outstanding washing quality without the variation between works can be obtained.

[0048] By the washing method of this invention, when change is lost in a predetermined time and the aforementioned electric conductivity judges the end of the aforementioned washing, the

aforementioned judgment can be performed easily.

[0049] moreover -- the washing method of this invention -- the above -- the penetrant remover which the oil content, the foreign matter, etc. mixed -- the outside of the aforementioned washing tub -- filtering -- the above -- by circulating to the aforementioned washing tub as a pure penetrant remover the above included in the penetrant remover in the aforementioned washing tub -- since a penetrant remover can be repeated and used while being able to judge the end of the aforementioned washing from the electric conductivity of the aforementioned penetrant remover like the above, since the amount of the foreign matter of an oil content and a solid-state is reduced, cost is reducible

[0050] When washing by immersing a work in the penetrant remover held in the washing tub in the washing station of this invention While a pure penetrant remover supplies the aforementioned washing tub by the aforementioned penetrant remover supply means, the penetrant remover mixed [foreign matter / the oil content removed from the aforementioned work by the aforementioned penetrant remover eccrisis means,] discharges out of this washing tub. By measuring the electric conductivity of the penetrant remover in the aforementioned washing tub with time by the electric conductivity measurement means prepared in the aforementioned washing tub, it can have a time of the size of change in the predetermined time of this electric conductivity becoming below a predetermined decision value, and the end of the aforementioned washing can be judged by the aforementioned end judging means.

[0051] a penetrant-remover circulation means connect the aforementioned penetrant-remover eccrisis means and the aforementioned penetrant-remover supply means at the aforementioned washing station -- preparing -- this penetrant-remover circulation means -- the above -- the penetrant remover taken out from the aforementioned washing tub by the aforementioned penetrant-remover eccrisis means can filter by the aforementioned filtration means, and it can circulate to the aforementioned washing tub by the aforementioned penetrant-remover supply means as a pure penetrant remover by establishing a penetrant-remover filtration means filter an oil content, a foreign matter, etc.

[0052] Moreover, in the washing station of this invention, since the aforementioned ultrasonic cleaning is performed very quickly in case a ultrasonic vibrator is prepared in the pars basilaris ossis occipitalis of the aforementioned washing tub and ultrasonic cleaning is performed, change of the electric conductivity of the aforementioned penetrant remover becomes clear. Therefore, change of the aforementioned electric conductivity can be grasped easily and the end of the aforementioned ultrasonic cleaning can be judged certainly.

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TECHNICAL FIELD

[Industrial Application] this invention relates to the method and washing station which are immersed in the penetrant remover held in the washing tub in a work, and are washed by ultrasonic cleaning etc.

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PRIOR ART

[Description of the Prior Art] Conventionally, a work is immersed in the penetrant remover held in the ultrasonic-cleaning tub which equips a bottom with a ultrasonic vibrator in works, such as a fabricating-operation article, and the ultrasonic-cleaning method which emits and washes an ultrasonic wave from the aforementioned ultrasonic vibrator to the aforementioned penetrant remover is learned. the foreign matter of solid-states, such as a foreign matter of solid-states, such as material waste which has adhered to removal or the work front face of a barricade by obtaining the cleaning effect which was excellent in such an ultrasonic-cleaning method by using the penetrant remover which deaerated the dissolved gas, and changing the grade of deaeration according to a work, and material waste which has adhered to the work front face through an oil content, or an oil content -- the very thing etc. can be washed

[0003] By the aforementioned ultrasonic-cleaning method, an oil content, a foreign matter, etc. which were removed from the work by washing of a work mix in the aforementioned penetrant remover, and if it is left, the washing capacity of this penetrant remover will be lost for a short time. Then, maintenance of the washing capacity is achieved by an oil content, a foreign matter, etc. which were mixed in this penetrant remover removing, and circulating to the aforementioned ultrasonic-cleaning tub as a pure penetrant remover by usually taking out and filtering the aforementioned penetrant remover out of the aforementioned ultrasonic-cleaning tub.

[0004] By the aforementioned ultrasonic-cleaning method, being washing time immersed of predetermined is carried out, and a work is washed by the aforementioned penetrant remover. Since the aforementioned washing time is experientially deduced according to the form of a work and the aforementioned penetrant remover is maintained by the state pure above always, a work can be efficiently washed under a certain condition by setting up the aforementioned washing time beforehand.

[0005] However, if it washes according to the aforementioned washing time set up beforehand, since the aforementioned washing time will become fixed irrespective of the state of each work, there is un-arranging, that nonuniformity may be made to the washing quality for every work.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention] In case a work is washed according to the washing method of this invention so that clearly from the above thing, the electric conductivity of the aforementioned penetrant remover in the aforementioned washing tub is measured. When the size of change of this electric conductivity in a predetermined time becomes below a predetermined decision value, by judging with what the aforementioned washing ended, washing can be ended for every washing of each work at the suitable time, and the outstanding washing quality without the variation between works can be obtained.

[0048] By the washing method of this invention, when change is lost in a predetermined time and the aforementioned electric conductivity judges the end of the aforementioned washing, the aforementioned judgment can be performed easily.

[0049] moreover -- the washing method of this invention -- the above -- the penetrant remover which the oil content, the foreign matter, etc. mixed -- the outside of the aforementioned washing tub -- filtering -- the above -- circulating to the aforementioned washing tub as a pure penetrant remover the above included in the penetrant remover in the aforementioned washing tub -- since a penetrant remover can be repeated and used while being able to judge the end of the aforementioned washing from the electric conductivity of the aforementioned penetrant remover like the above, since the amount of the foreign matter of an oil content and a solid-state is reduced, cost is reducible

[0050] In the washing station of this invention, a work is immersed in the penetrant remover held in the washing tub. When washing, while a pure penetrant remover supplies the aforementioned washing tub by the aforementioned penetrant remover supply means, the penetrant remover mixed [foreign matter / the oil content removed from the aforementioned work by the aforementioned penetrant remover eccrisis means,] discharges out of this washing tub. By measuring the electric conductivity of the penetrant remover in the aforementioned washing tub with time by the electric conductivity measurement means prepared in the aforementioned washing tub, it can have a time of the size of change in the predetermined time of this electric conductivity becoming below a predetermined decision value, and the end of the aforementioned washing can be judged by the aforementioned end judging means.

[0051] a penetrant-remover circulation means connect the aforementioned penetrant-remover eccrisis means and the aforementioned penetrant-remover supply means at the aforementioned washing station -- preparing -- this penetrant-remover circulation means -- the above -- the penetrant remover taken out from the aforementioned washing tub by the aforementioned penetrant-remover eccrisis means can filter by the aforementioned filtration means, and it can circulate to the aforementioned washing tub by the aforementioned penetrant-remover supply means as a pure penetrant remover by establishing a penetrant-remover filtration means filter an oil content, a foreign matter, etc.

[0052] Moreover, in the washing station of this invention, since the aforementioned ultrasonic cleaning is performed very quickly in case a ultrasonic vibrator is prepared in the pars basilaris ossis occipitalis of the aforementioned washing tub and ultrasonic cleaning is performed, change of the

electric conductivity of the aforementioned penetrant remover becomes clear. Therefore, change of the aforementioned electric conductivity can be grasped easily and the end of the aforementioned ultrasonic cleaning can be judged certainly.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] this invention cancels this un-arranging and aims at offering the washing method and washing station which can obtain uniform washing quality irrespective of the state of each work.

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MEANS

[Means for Solving the Problem] In order to attain this purpose, the washing method of this invention When it is immersed and a work is washed to the penetrant remover held in the washing tub, while supplying a pure penetrant remover to this washing tub In the washing method which discharges the penetrant remover which the oil content removed by washing of this work, the foreign matter, etc. mixed out of this washing tub When the electric conductivity of the aforementioned penetrant remover in the aforementioned washing tub is measured and the size of change of this electric conductivity in a predetermined time becomes below a predetermined decision value, it is characterized by judging the end of the aforementioned washing.

[0008] When change of this electric conductivity in the aforementioned predetermined time is lost, you may make it the washing method of this invention judge the end of the aforementioned washing.

[0009] moreover, the washing method of this invention -- the above -- the penetrant remover which the oil content, the foreign matter, etc. mixed -- the outside of the aforementioned washing tub -- filtering -- the above -- it is characterized by circulating to the aforementioned washing tub as a pure penetrant remover

[0010] A penetrant remover supply means to supply a pure penetrant remover to this washing tub when the washing method of this invention immerses for it and washes a work to the washing tub which holds a penetrant remover, and this washing tub, In the washing station which consists of a penetrant remover discharge means to discharge the penetrant remover which the oil content removed by washing of this work, the foreign matter, etc. mixed out of this washing tub An electric conductivity measurement means to measure measurement for the electric conductivity of this penetrant remover is prepared in this washing tub. When the size of change in the predetermined time of the electric conductivity of the aforementioned penetrant remover measured by this electric conductivity measurement means becomes below a predetermined decision value, it can carry out advantageously by the washing station which comes to prepare an end judging means to judge the end of the aforementioned washing.

[0011] a penetrant remover circulation means to make this washing tub circulate through the penetrant remover which connected the aforementioned penetrant remover discharge means and the aforementioned penetrant remover supply means, and was taken out from the aforementioned washing tub by this penetrant remover discharge means in the aforementioned washing station by this penetrant remover supply means -- preparing -- this penetrant remover circulation means -- the above -- a penetrant remover filtration means filter an oil content, a foreign matter, etc. is established, and a bird clapper is carried out as the feature Moreover, the aforementioned washing station prepares a ultrasonic vibrator in the bottom of the aforementioned washing tub, and is characterized by the bird clapper.

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OPERATION

[Function] If a work is washed in the penetrant remover held in the washing tub, the foreign matter of the oil content removed from the work and a solid-state will mix in a penetrant remover. If the penetrant remover which the foreign matter of the oil content removed by washing of the aforementioned work and a solid-state mixed is discharged out of this washing tub while supplying a pure penetrant remover to the aforementioned washing tub at this time -- the above -- although the amount of the foreign matter of an oil content and a solid-state once increases immediately after the washing start of a work, it decreases gradually and the penetrant remover in a washing tub is again returned to a pure state

[0013] the above -- since the foreign matter of an oil content and a solid-state carries movement of a charge in the aforementioned penetrant remover -- the electric conductivity of the aforementioned penetrant remover -- the above in the aforementioned penetrant remover -- it fluctuates corresponding to the amount of the foreign matter of an oil content and a solid-state namely, -- the pure penetrant remover before washing a work -- **** -- low electric conductivity becomes high rapidly immediately after starting washing of a work, and if the amount of the foreign matter of the oil content which washing advances and is mixed in this penetrant remover from this work, and a solid-state is decreased successively, it will become low gradually

[0014] Therefore, when measuring the electric conductivity of the aforementioned penetrant remover in the aforementioned washing tub, and the electric conductivity which once increased starts to decrease and the size of change of this electric conductivity in a predetermined time becomes below a predetermined decision value. the above mixed in the ***** penetrant remover -- the foreign matter of an oil content and a solid-state is discharged, and it judges that new mixing was lost more than it -- having -- this time -- with, the end of the aforementioned washing is judged

[0015] By the washing method of this invention, when change of the electric conductivity in a predetermined time is lost, the aforementioned judgment becomes easy by judging the end of the aforementioned washing.

[0016] the washing method of this invention -- the above -- the penetrant remover which the oil content, the foreign matter, etc. mixed -- the outside of the aforementioned washing tub -- filtering -- the above -- the above included in the penetrant remover in the aforementioned washing tub by circulating to the aforementioned washing tub as a pure penetrant remover -- the amount of the foreign matter of an oil content and a solid-state is reduced, and the end of the aforementioned washing is judged from the electric conductivity of the aforementioned penetrant remover like the above Moreover, by circulating a penetrant remover as mentioned above, a penetrant remover can be repeated and used and cost is reduced.

[0017] In the washing station of this invention, when washing by immersing a work in the penetrant remover held in the washing tub, while a pure penetrant remover is supplied to the aforementioned washing tub by the aforementioned penetrant remover supply means, the penetrant remover mixed [

foreign matter / the oil content removed from the aforementioned work by the aforementioned penetrant remover discharge means,] is discharged out of this washing tub. And the electric conductivity of the penetrant remover in the aforementioned washing tub is measured with time by the electric conductivity measurement means prepared in the aforementioned washing tub, and when the size of change in the predetermined time of this electric conductivity becomes below a predetermined decision value, the end of the aforementioned washing is judged by the aforementioned end judging means.

[0018] a penetrant remover circulation means to connect the aforementioned penetrant remover discharge means and the aforementioned penetrant remover supply means in the aforementioned washing station -- preparing -- this penetrant remover circulation means -- the above -- establishing a penetrant remover filtration means to filter an oil content, a foreign matter, etc. the penetrant remover taken out from the aforementioned washing tub by the aforementioned penetrant remover discharge means -- the aforementioned filtration means -- the above -- an oil content, a foreign matter, etc. are filtered and it circulates to the aforementioned washing tub by the aforementioned penetrant remover supply means as a pure penetrant remover

[0019] Moreover, the washing station of this invention is especially used advantageously, when preparing a ultrasonic vibrator in the bottom of the aforementioned washing tub and performing ultrasonic cleaning. the above which has adhered to the aforementioned work according to the aforementioned ultrasonic cleaning -- an oil content, a foreign matter, etc. are removed quickly and the cleaning effect which was excellent when discharged by the aforementioned aforementioned penetrant remover discharge means out of the aforementioned washing tub is obtained Since the aforementioned ultrasonic cleaning is performed very quickly, change of the electric conductivity of the aforementioned penetrant remover is grasped easily, and the end of the aforementioned ultrasonic cleaning is judged certainly.

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EXAMPLE

[Example] Next, it explains in more detail about the washing method of this invention, and a washing station, referring to an attached drawing. the ** type view in which drawing 1 shows the example of 1 composition of the washing station of this invention -- it is -- drawing 2 -- washing time and an oil content -- it is the graph which shows the relation between the amount of residues, and current value [0021] The ultrasonic-cleaning tub 5 which emits an ultrasonic wave to a penetrant remover 3 from ultrasonic-vibrator equipment 2, and washes a work 4 when the ultrasonic cleaner 1 of this example is immersed in the penetrant remover 3 to which ultrasonic-vibrator equipment 2 was supplied in the tub in preparation for a pars basilaris ossis occipitalis in a work 4, as shown in drawing 1 , It consists of an overflow tub 6 which holds the penetrant remover 3 overflowed when it is adjacently prepared in the ultrasonic-cleaning tub 5 and a work 4 is immersed in the ultrasonic-cleaning tub 5, and the ultrasonic-cleaning tub 5 and the overflow tub 6 are connected by the sloping effluent way 7.

[0022] Moreover, ultrasonic-vibrator equipment 2 comes to hold the ultrasonic vibrator which is not illustrated in the hermetically sealed enclosure made from stainless steel, and this ultrasonic vibrator emits a predetermined ultrasonic wave based on the ultrasonic signal sent from an external ultrasonic wave oscillator. In order to protect ultrasonic-vibrator equipment 2 from the erosion by the ultrasonic wave, nickel plating is performed to the front face.

[0023] Penetrant remover output port 8 and the penetrant remover feed hopper 9 carry out phase opposite, and are prepared in the side of the ultrasonic-cleaning tub 5, it connects through the conduit 10 in the exterior of the ultrasonic-cleaning tub 5, and the penetrant remover 3 in the ultrasonic-cleaning tub 5 circulates through penetrant remover output port 8 and the penetrant remover feed hopper 9 from penetrant remover output port 8 to the penetrant remover feed hopper 9 via a conduit 10 with the pump 11 formed in the middle of the conduit 10. In addition, the rectifier (not shown) which forms a laminar flow parallel to ultrasonic-vibrator equipment 2 within the ultrasonic-cleaning tub 5 by the penetrant remover 3 which is taken out from the ultrasonic-cleaning tub 5, or is supplied to the ultrasonic-cleaning tub 5 is built in penetrant remover output port 8 and the penetrant remover feed hopper 9.

[0024] A filter 12 is formed in the lower stream of a river of a pump 18 at a conduit 10, the foreign matter of solid-states, such as an oil content mixed in a penetrant remover 3 by washing of a work 4 or a barricade, and material waste, is filtered, and it removes.

[0025] Moreover, the deaerator 13 which deaerates the dissolved gas of a penetrant remover 3 is formed in the lower stream of a river of a filter 12 at the conduit 10. The vacuum deairing equipment which a deaerator 13 introduces a penetrant remover 3 into the decompressed seal tub, is made to emit the dissolved gas in a penetrant remover 3 to the reduced pressure space in this seal tub, and is deaerated, Many hollow-filament-like gas permeation membranes are held, and while circulating a penetrant remover 3 in this hollow-filament-like gas permeation membrane, the

gas-permeation-membrane module which decompresses the outside of this hollow-filament-like gas permeation membrane, and separates the dissolved gas in a penetrant remover 3 through this hollow-filament-like gas permeation membrane is used.

[0026] A penetrant remover 3 is deaerated by the deaerator 13, and the dissolved oxygen concentration is adjusted in 0.01-5 ppm according to the gestalt or the washing purpose of a work 4. In addition, since a ultrasonic cleaner 1 is used in air, although the gas dissolved in the penetrant remover 3 is air in fact, since air composition is simultaneously regularity in oxygen:nitrogen $1:4$, dissolved oxygen concentration is used as an index which shows total dissolved gas concentration.

[0027] the pars basilaris ossis occipitalis of the ultrasonic-cleaning tub 5 and the overflow tub 6 -- respectively -- the object for eccrisis of a penetrant remover 3 -- Conduits 14a and 14b prepare -- having -- **** -- the object for eccrisis -- Conduits 14a and 14b are connected to the conduit 10 by the upstream of a pump 11 moreover, the conduit 10 -- the lower stream of a river of a deaerator 13 -- assistance -- a conduit 15 -- branching -- assistance -- the conduit 14 is connected to the auxiliary feed hopper 16 prepared in the upper part of the ultrasonic-cleaning tub 5 the above -- a conduit 10 and the object for eccrisis -- Conduits 14a and 14b and assistance -- a bulb 17 arranges in a conduit 15 suitably -- having -- each -- the flow rate of a conduit can be adjusted now Moreover, the heater 18 is formed in the pars basilaris ossis occipitalis of the ultrasonic-cleaning tub 5 so that a penetrant remover 3 can be warmed if needed.

[0028] In the ultrasonic cleaner 1 of 1^{**} , the electric conductivity of a penetrant remover 3 is measured by the current detector 20 which formed the power supply 19 of direct-current 12V outside, connected with the electrode boards 19a and 19b immersed in the ultrasonic-cleaning tub 5, and was connected with DC power supply 19 in series. Moreover, the current detector 20 is connected to an end judging means 21 to judge the end of washing of a work 4 from the size of change in the predetermined time of the aforementioned electric conductivity.

[0029] Furthermore, the work 4 conveyed by move means 22 to transport a work 4 to a ultrasonic cleaner 1, and to take out, and the move means 22 is transferred to a ultrasonic cleaner 1, a rise-and-fall means 23 by which it is immersed in the ultrasonic-cleaning tub 5 is formed in it, it connects with the rise-and-fall means 23, and the aforementioned end judging means 21 controls the operation.

[0030] Next, the case where the blade (iron) of a compressor is washed as a work 4 is taken and explained to an example about the washing method by the ultrasonic cleaner 1 of this example. Double-sided lap processing is given with the abrasive grain (8.0 micrometers of mean particle diameters) and straight mineral oil of #1500, and, as for the blade of a compressor, an abrasive grain and material waste have adhered to the front face with straight mineral oil.

[0031] By the washing method of this example, the aforementioned blade (work 4) first held in the receipt basket made from stainless steel which is not illustrated is transported to a ultrasonic cleaner 1 from a last process by the move means 22, and is transferred to the rise-and-fall means 23 the aforementioned whole receipt basket. Subsequently, the rise-and-fall means 23 descends and the aforementioned blade (work 4) held in this receipt basket is immersed in the ultrasonic-cleaning tub 5. And the end judging means 21 operates and measurement of the electric conductivity of a penetrant remover 3 is immediately started by the current detector 20.

[0032] The tap water containing 5% of weak alkali cleaners is supplied to the ultrasonic-cleaning tub 5 as a penetrant remover 3, and a penetrant remover 3 is taken out from penetrant remover output port 8 with a pump 11, and it circulates through it to the ultrasonic-cleaning tub 5 via the filter 12 and the deaerator 13 with the conduit 10 from the penetrant remover feed hopper 9 and the auxiliary feed hopper 16. The aforementioned circulation and it is performed by [as supplying about 0.25 - 0.95%/second of penetrant removers 3 of the capacity of the ultrasonic-cleaning tub 5]. In this example, the 0.25l. [/second] penetrant remover 3 is discharged and supplied to the

ultrasonic-cleaning tub 5 which has a capacity of 60l.

[0033] Next, from the ultrasonic vibrator held in ultrasonic-vibrator equipment 2, an ultrasonic wave is emitted to a penetrant remover 3, and ultrasonic cleaning of a work 4 is performed. The aforementioned ultrasonic wave is 25kHz in output 600w and frequency, and is 1 w/cm². It is density.

[0034] the impulse wave by decay of cavitation since the penetrant remover 3 is deaerated so that it may become the aforementioned dissolved oxygen concentration if ultrasonic cleaning of a work 4 is started -- the front face of a work 4 -- acting -- an oil content -- and -- this -- the foreign matter of the solid-state which has adhered through an oil content is removed from the front face of a work 4, and mixes in a penetrant remover 3 then, the above -- since the foreign matter of an oil content and a solid-state carries movement of a charge in a penetrant remover 3, the electric conductivity of a penetrant remover 3 becomes high, and is detected by the current detector 20 as an increase in the current between electrode board 19a and 19b

[0035] If the foreign matters of the oil content and solid-state from which washing of a work 4 is removed by going on decrease in number since it circulates to the ultrasonic-cleaning tub 5 from the penetrant remover feed hopper 9 and the auxiliary feed hopper 16 after a penetrant remover 3 is taken out from penetrant remover output port 8 as mentioned above and filtered with a filter 12, it will defecate gradually the penetrant remover 3 in the ultrasonic-cleaning tub 5, and the electric conductivity of the aforementioned penetrant remover 3 will be decreased successively. Successive diminution of this electric conductivity is measured with time by the current detector 20, and is outputted to the end judging means 21. And if it detects that the change of the aforementioned electric conductivity of the end judging means 21 was lost within the predetermined time, it will judge with what washing ended, the rise-and-fall means 23 will be raised, and the aforementioned receipt basket will be pulled up from the ultrasonic-cleaning tub 5.

[0036] Next, the aforementioned receipt basket which was able to be pulled up is transferred to the transfer means 22 from the rise-and-fall means 23, and is taken out from a ultrasonic cleaner 1, and washing operation ends it.

[0037] the aforementioned washing operation -- setting -- with time -- continuing -- the oil content of a work 4 -- when the amount of residues was measured, the result as shown in the following table 1 was obtained in addition, the above -- an oil content -- the oil content in which the amount of residues has adhered to the work 4 -- a carbon tetrachloride -- extracting -- the oil content in the carbon tetrachloride of the specified quantity -- it asked by measuring concentration with an infrared absorption method

[0038]

[Table 1]

洗淨時間 (秒)	0	0.5	1.0	2.0	5.0	10	30	60	90
油分残渣 (mg)	250	55	45	18.5	5.6	0.80	0.42	0.40	0.36

[0039] If washing time becomes 30 seconds or more from Table 1, it is clear that it becomes the amount of traces of the oil content which had adhered before the amount of residues of the oil content adhering to the work 4 washing, and can treat as an excellent article.

[0040] Next, the current value of the penetrant remover 3 between electrode board 19a corresponding to the washing time of Table 1 measured by the current detector 20 as electric conductivity of a penetrant remover 3 for every time and 19b is shown in the following table 2.

[0041]

[Table 2]

洗淨時間 (秒)	0	0.5	1.0	2.0	5.0	10	30	60	90
電流値 (mA)	10	75	50	24	10	5	1.5	1.5	1.5

[0042] After 30 second when the oil content in which the current value which became high rapidly soon when washing started fell gradually along with advance of washing, and has adhered to the work 4 serves as the amount of traces from Table 2, it is clear that the change is lost by 1.5mA. Although what an oil content, an abrasive grain, material waste, etc. mix this in a penetrant remover 3 immediately after the start of washing, and carries movement of a charge in a penetrant remover 3 increases rapidly Since it circulates through a penetrant remover 3 as mentioned above and it is filtered with a filter 12, oil contents, abrasive grains, material waste, etc. in a penetrant remover 3 decrease in number gradually, and it can reach for the oil content adhering to the work 4 to become the amount of traces, and can be considered to become fixed.

[0043] The graph which compounded the result of Table 1 and 2 is shown in drawing 2 . By this example, although it almost has the amount of traces after the amount of residues of the oil content adhering to the work 4 decreases quickly and 30 seconds pass since a washing start by ultrasonic cleaning, the current value of a penetrant remover 3 increases once after a washing start, and becomes fixed after 30 seconds, so that clearly from Table 1, Table 2, and drawing 2 . And henceforth [this time], since change is lost, change of the aforementioned current value can be grasped easily and the end of washing can be judged certainly.

[0044] You may make it judge with what washing ended as what does not have influence in a cleaning effect substantially even if it continues washing more than it, when it is decreasing with the inclination with the aforementioned loose current value between predetermined times, for example, 30 arbitrary seconds, although, as for the aforementioned current value, change was completely lost at this example henceforth [30 second after a washing start], and it becomes below less than current value predetermined in the range of fluctuation, for example, 1mA.

[0045] Moreover, although the current value of the penetrant remover 3 between the electrode boards 19a and 19b immersed in the ultrasonic-cleaning tub 5 is measured in the ultrasonic cleaner 1 of **1**, when the basket made from the aforementioned stainless steel is immersed in the ultrasonic-cleaning tub 5 and a work 4 is washed, in order to use the capacity of the ultrasonic-cleaning tub 5 efficiently, the space immersed in the electrode boards 19a and 19b may not be obtained. When such, one side of the electrode boards 19a and 19b is replaced with the basket or the ultrasonic-vibrator equipment 2 made from stainless steel with which a work 4 is held, and it may be made use the basket or the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel as an electrode board, and the basket and the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel are connected to DC power supply 19, and you may make it use the basket and the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel as an electrode board. When using the basket and the ultrasonic-vibrator equipment 2 made from the aforementioned stainless steel as an electrode board, the basket made from for example, the aforementioned stainless steel is connected to the anode plate side of DC power supply 19, and ultrasonic-vibrator equipment 2 is connected to the cathode side of DC power supply 19.

[0046] Furthermore, when the ultrasonic-cleaning tub 5 consists of a conductive material, you may use the ultrasonic-cleaning tub 5 as an electrode. When using the ultrasonic-cleaning tub 5 as an electrode, the current value of the penetrant remover 3 between the ultrasonic-cleaning tub 5, a work

4, or ultrasonic-vibrator equipment 2 is measured, or the electrode boards 19a or 19b are immersed in a penetrant remover 3, and the current value of the penetrant remover 3 between the electrode boards 19a or 19b and the ultrasonic-cleaning tub 5 is measured.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The ** type view showing the example of 1 composition of the washing station of this invention.

[Drawing 2] washing time and an oil content -- the graph which shows the relation between the amount of residues, and current value

[Description of Notations]

3 [-- A penetrant remover eccrisis means 9 / -- A penetrant remover supply means, 10 / -- A penetrant remover circulation means, 12 / -- A penetrant remover filtration means, 20 / -- An electric conductivity measurement means, 21 / -- End judging means.] -- A penetrant remover, 5 -- A washing tub, 8

[Translation done.]

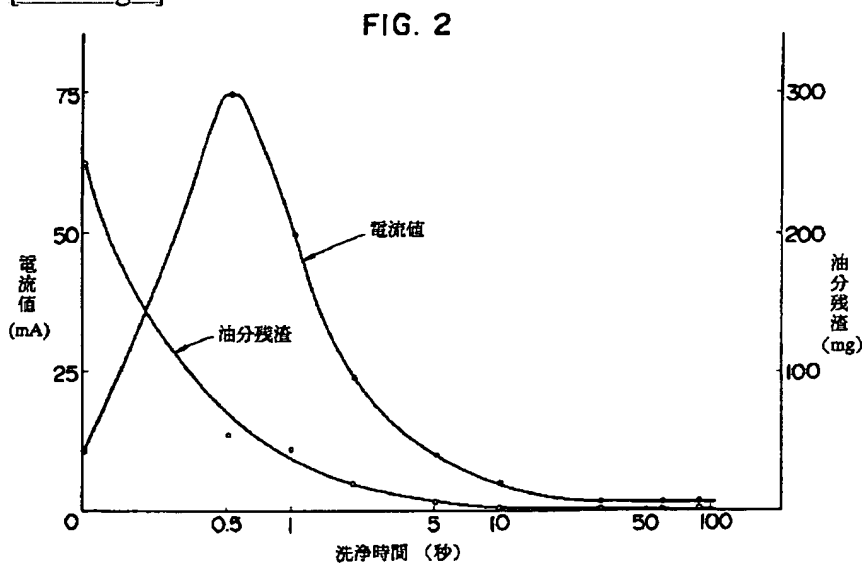
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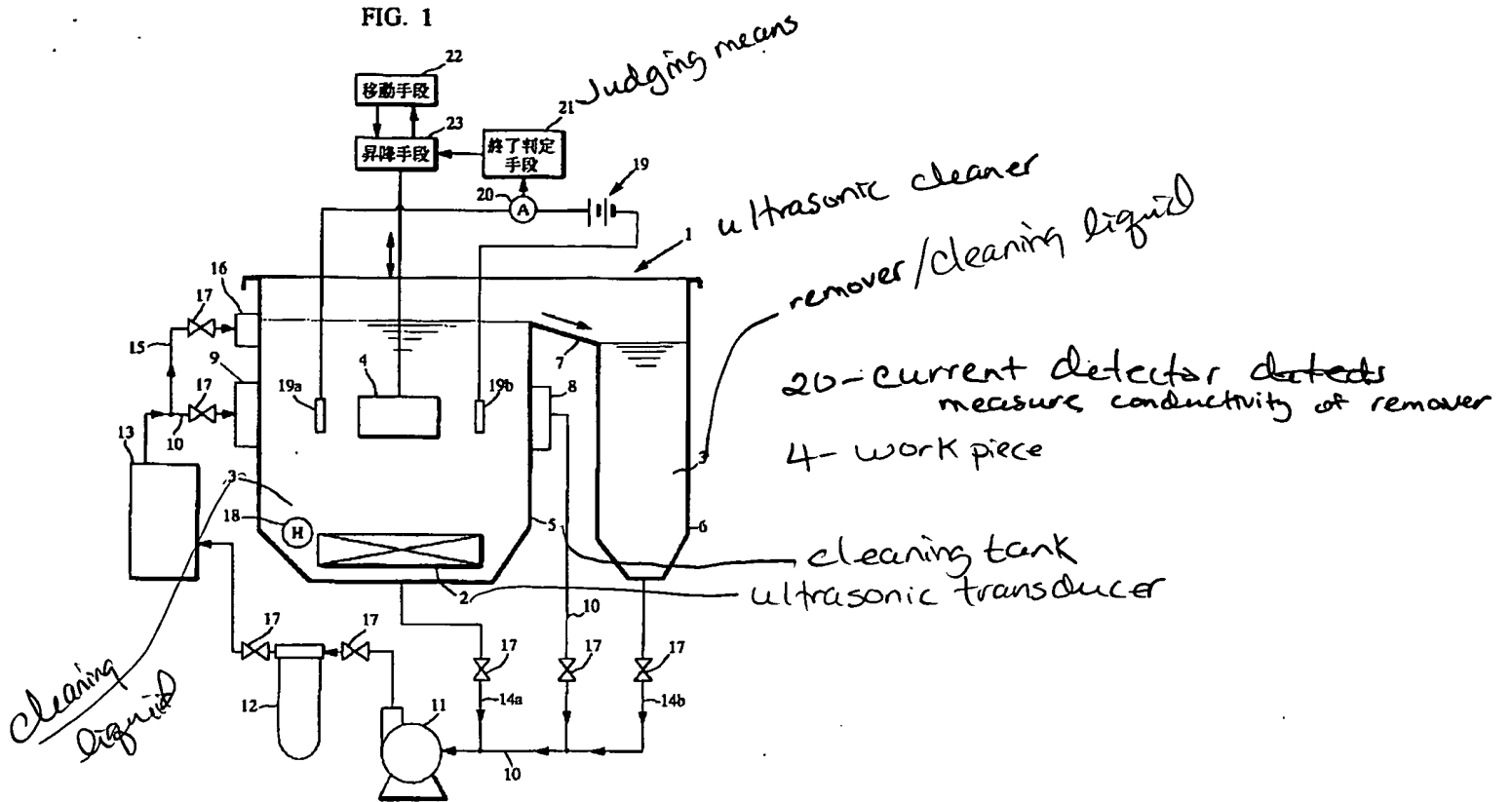
DRAWINGS

[Drawing 2]



[Drawing 1]

FIG. 1



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